Lepton Pair Production from ultrarelativistic heavy ion collisions

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Abstract

Impact parameter dependent of lepton pair production cross sections in relativistic heavyion collisions have been calculated for all impact parameters [1]. All these calculations show that multipair production is mainly dominated at impact parameters smaller than the Compton wavelength of the electron. For the heavyions (Au+Au or Pb+Pb) the coupling constant is large compare to the light ions. This fact and unitarity violation in low order perturbative calculations clearly suggest that higherorder QED effects or nonperturbative effects are important at the RHIC. Baltz and McLerran [2] have also calculated the production of electronpositron pairs by utilizing the time dependent Dirac equation in the ultrarelativistic limit. They have shown that this method sums up all higher order diagrams in the high energy limit and integrating over the impact parameter, the exact cross section for any specific final electron positron state equals the perturbational theory result [3]. I have used the same method [4] and modified our previous calculations[1]. This higher order corrected cross section for high multiplicity electronpositron pair production show deviations from perturbation theory by being substantially smaller. An experiment that can measure these higher order effects will help us to understand the nonperturbative QED.

References

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